

AD-A086 185

NAVAL DENTAL RESEARCH INST GREAT LAKES IL  
THE HEALTH OF NAVAL RECRUITS: DENTAL CARIES.(U)  
MAY 80 J C CECIL, M R WIRTHLIN, R G WALTER  
NORT-PR-80-05

F/8 6/5

UNCLASSIFIED

NL

1 OF 1  
AD-A086 185




END  
DATE  
FILMED  
8-80  
DTIC

LEVEL II

20



NDRI-PR 80-05  
May 1980

ADA 086185

## THE HEALTH OF NAVAL RECRUITS: DENTAL CARIES

BY

J. C. CECIL  
M. R. WIRTHLIN  
R. G. WALTER  
E. J. MANDEL

DTIC  
ELECTE  
JUL 1 1980  
S D A

DDC FILE COPY

NAVAL  
DENTAL RESEARCH  
INSTITUTE

Naval Medical Research and Development Command  
Bethesda, Maryland

80 6 30 018

NAVAL DENTAL RESEARCH INSTITUTE  
NAVAL BASE, BLDG. 1-H  
GREAT LAKES, ILLINOIS 60088

The Health of Naval Recruits:  
Dental Caries

J. C. Cecil  
M. R. Wirthlin  
R. G. Walter  
E. J. Mandel

Research Progress Report NDRI-PR 80-05  
Work Unit ZF58524012-0006  
Naval Medical Research and Development Command  
National Naval Medical Center  
Bethesda, Maryland 20014

Accession No.	
NTA	1001
DDI	1001
Unpublished	
Justification	
by	
Distribution	
Availability Codes	
Dist	Avail and/or Special

The opinions expressed herein are those of the authors and cannot be construed as reflecting the views of the Navy Department or the Naval Service at large. The use of commercially available products does not imply endorsement of these products or preference to other similar products on the market.

This document has been approved for public release; its distribution is unlimited.

Approved and released by:

*M R Wirthlin Jr.*  
M. R. WIRTHLIN, JR.  
Captain, DC, USN  
Commanding Officer

Dentists learn to treat dental caries by the intense concentration of their faculties on the curettage and plastic repair of carious tooth surfaces. The complete restoration of all surfaces of a tooth could be considered as requiring advanced dental operative procedures. The epitome of restorative dentistry could be considered the treatment required to rehabilitate the entire dentition for a patient. The marvels of modern dental practice can assure a patient excellence of health and appearance. However, in a community such as the naval service there are other important aspects to the practice of dentistry.

The Navy dental officer must also be concerned with preventive dentistry, for few diseases in the history of man have been fully managed by finding and treating every case. In order to provide the line commander in the fleet assurance of an acceptable state of dental health in his crew for sustained operations in remote areas, and for reduced non-effective days in training and replenishment periods, the Navy dental officer must consider a public health approach.

Whereas the individual dentist obtains facts -- signs and symptoms -- by clinical examination, the public health approach uses survey techniques. The clinician assimilates facts into a diagnostic opinion; the epidemiologist analyzes objective data; treatment plans for individual patients relate to program plans for the community; treatment procedures become program implementation; and patient recall becomes program evaluation. The management of dental and oral health in the Navy is directed to adequacy, combat readiness and cost-effectiveness through the use of public health surveillance, preventive dental practice, as well as traditional clinical practice.

Although Navy dental officers very competently define the treatment needs for individual patients as they are seen in the dental clinic, the scope and immensity of the dental disease problem within the larger Navy population has not been recently documented. The public health approach, or the determination of the disease levels among the masses of the naval population, can help in planning and evaluating the dental care program of the Navy. With the use of objective data, the efficiency and effectiveness of the dental care provided by Navy dental officers should be enhanced. These data might well be used to indicate where preventive programs might be initiated or intensified.

Schlack and Birren (1) reported, in 1946, that a small percentage of individuals tended to have the majority of the dental defects observed in a sample of naval personnel. Massler, Ludwick and Schour (2) examined 4,043 naval inductees (ages 17-20 years), in 1952, and observed that the mean decayed, missing or filled permanent teeth (DMFT = 11.3), and decayed, missing or filled permanent tooth surfaces (DMFS = 25.2) scores were similar to values obtained from an earlier survey involving a civilian population (3). In an attempt to predict future dental needs of the naval population, Cross (4) reported, in 1952, that recent inductees to the naval service had more need for restorative treatment than individuals who had been exposed to Navy dental care for 12 or more months. Hellman,

Ludwick and Oesterling (5) concluded from a 1952 survey of 183,000 Navy and Marine Corps recruits that the total dental needs of personnel on active duty could not then be met with the existing number of dental care providers. The inability to satisfy dental needs was related to the lowering of dental entrance standards for recruits in 1941, and which remain in effect today. In 1969, it was reported by Rovelstad, et al. (6), that the level of dental treatment needs was so high among recruits that, in the one hour allotted the average recruit for treatment, only a small amount of the needed dental treatment procedures were accomplished.

Farrell (7) in 1970, reported that of 978 dental patients aboard the U.S.S. New Jersey who initially required no dental treatment, only 254 (or 26 percent) still required no treatment after one year. Of those requiring dental care, 92 percent required operative dental procedures for treatment due to caries attack or failures in past restorative treatment.

Keene (8) reviewed data from dental health surveys of the Navy conducted between 1935 and 1972 and concluded that men who arrived at recruit training centers in later years had an improved caries experience compared with earlier studies. This improvement in total caries experience was related by Keene to public water fluoridation which occurred in the 1950's. The prevalence of teeth affected by caries, however, remained high among incoming naval recruits in 1972.

More recent surveys (9,10,11) of the dental health status of naval personnel have reaffirmed the almost overwhelming need for dental treatment due to dental caries presented by naval recruits. This report documents the need for dental treatment due to dental caries for a sample of naval recruits who received their basic training at the Recruit Training Center, Great Lakes, Illinois, between September 1975 and August 1978. A portion of the sample (354 subjects), following recruit training, obtained advanced training in a service school at the Great Lakes Naval Training Center. They were followed for six months to identify those individuals most at-risk for new carious lesions.

#### METHODS AND MATERIALS

##### The Sample

Naval recruits at Great Lakes Naval Training Center were selected for participation in the survey in two groups. One group was selected randomly by billet number from one recruit training company per week (randoms). The second group was chosen from the same company based on their pre-induction selection for further training at a technical school at Great Lakes, Illinois (service school-selected). The pre-induction selection was accomplished by Navy recruiting personnel using scores from the Armed Forces Qualification Test Scores (AFQTS) and naval service standards. The service school-selected group was expected to remain in the Great Lakes area for up to six months for re-examination. The random group was chosen in order that comparisons of dental disease and demographic characteristics with the service school-selected group might be accomplished.

### The Dental Caries Examination

Each Monday morning approximately 10 service school-selected and five randomly selected recruits were asked to participate in the initial examinations. Informed consent was obtained orally. These examinations were required of all recruits as part of the enlistment process, no refusals were encountered. All examinations were performed by calibrated examiners, using an artificial light source, with the subject seated comfortably in a reclining dental chair. A dental technician, familiar with the data collection protocol, recorded the diagnostic data on special forms (Figure 1) as the examination was conducted.

Caries experience was scored by the method of Klein, Knutson, and Palmer (12) using the criteria of W.H.O. (13) for caries diagnosis. Carious lesions for a tooth were also graded as to depth within dentin by the use of bitewing radiographs. B-lesions (BLES) were defined as those lesions with caries extending less than one-fourth the distance from the dentino-enamel junction to the pulp. C-lesions (CLES) extended one-fourth to three-fourths through dentin; urgent or U-lesions (ULES) extended more than three-fourths through the dentin. The sequence of examinations was conducted blindly to the examiner, in that the sample categorization of each subject was unknown to the examiner. Panoraphic and bitewing radiographs were available as diagnostic aids, and periapical radiographs were exposed as required. Standardization of the radiographic technic was not attempted to ensure that the clinic routine of the host dental in-processing facility would not be unduly disrupted. Sickle explorers (#23) and front surface mouth mirrors, were used in the examination; gauze sponges and compressed air for drying teeth were available.

All subjects were asked to answer simple questions at the initial examination regarding their present age, place of last residence, and whether or not they were high school graduates.

A GED equivalent was considered as equivalent to high school graduation. The place of residence was considered a city if over 50,000 in population, while a farm residence denoted an actual food production location.

### Data Compilation

The raw data were converted to DMFT, DMFS and component scores. Total tooth surfaces-at-risk (SAR) for all teeth, excluding third molars, and posterior proximal surfaces (PPSAR) at-risk were computed for all subjects. Surfaces-at-risk were defined as those sound tooth surfaces not affected by decay, fillings, or missing due to decay. Teeth missing due to trauma or orthodontically required removal were not included in SAR or PPSAR. The posterior surfaces used for computing the PPSAR were the sound surfaces from the distal of the first premolar to the distal of the second permanent molar inclusive -- a maximum of 28 sound, posterior proximal surfaces per subject with a DMFS score of zero. In a subject with a DMFS equal to zero, a maximum of 140 sound surfaces was possible in calculating the SAR. All teeth were considered to have five surfaces. If at a later examination a tooth was found missing, the number of missing surfaces due to caries was considered to be the number of decayed surfaces at the first examination.

For those service school-selected subjects who were available for reexamination at six months, both the overall caries attack rate (CAR) and a posterior proximal caries attack rate (PPCAR) were computed. The CAR and PPCAR were calculated as the difference in sound surfaces between the initial and six-month examination divided by the number of initially sound surfaces.

From the raw data sheets, treatment plans were formulated for each subject using pre-determined criteria. The criteria were derived from meetings with dental clinicians of the Naval Regional Dental Center, Great Lakes, during 1975. The criteria used reflected the consensus of needed projected treatment procedures appropriate for recruit dental care at Great Lakes. A 1975 Veterans Administration fee schedule was used to estimate the value of projected treatment. The value of the projected treatment was computed as the mean number of treatment-procedures-projected times the applicable dollar cost for that service. The removal of impacted or malposed third molars was included in the treatment projections.

Data files maintained by the Naval Health Research Center, San Diego, California, were used to develop a prediction model for those most-at-risk for increased treatment requirements. The CAR and PPCAR values for 354 service school-selected subjects, on whom six-month data were available, were used as outcome variables with independent variables such as Mental Group Scores, AFQTS, Screen Scores, and age. The independent variables used reflected some of those characteristics employed by Navy recruiters in selecting individuals for advanced technical training prior to basic training. The Screen Score is defined as the success chances in the Navy for recruits. The score is derived by weighting the variables age, education, AFQTS, and dependent status at the time of recruitment. The Armed Forces Qualification Test Score (AFQTS) is the aptitude testing instrument used by Navy recruiters in the field to classify potential enlistees into the various job specialties of the naval service. The Mental Group Score is a categorization of the AFQTS used also by recruiters in determining the suitability of an enlistee for particular specialty designations.

## RESULTS

### Prevalence of Dental Caries

Table I depicts the age, residence and educational background of the 1186 subjects examined initially. As can be noted, there were no age or residency differences overall between the service school and the randomly selected groups. There were, however, significant differences between the two groups in the number of high school graduates. The randomly selected group was composed of a greater percentage of non-high school graduates than the service school group.

The randomly selected group had significantly greater numbers of decayed teeth than did the service school-selected group, Table II. The DT/DMFT ratio was significantly greater for the random group. The DS/

DMFS ratio was, likewise, greater for the random groups. Less than two percent of either the random or service-school group presented with a DMFT score of zero (i.e., no past or present caries experience). About five percent of the randoms and 10 percent of the service school group had no active decay detected at the initial examination.

It is interesting to note from further analysis of the data that within the randomly selected group, 83.9 percent of recruits from cities over 50,000 in population had no missing teeth, whereas only 69.6% of those who reported as being from towns of less than 50,000 populations or farms had no missing teeth due to caries. A similar relationship was observed with respect to missing tooth surfaces and DMFT scores for the randoms. These frequency distributions with respect to missing teeth and surfaces between cities and towns of the randoms were statistically significant using chi-square analysis ( $p < 0.025$ ).

Among the random group there were significantly more posterior proximal surfaces initially at-risk (sound) for the high school graduates than for the non-high school graduates ( $p < 0.01$ ). Service school selected subjects followed a similar pattern as the random group in that high school graduates had significantly greater numbers of filled teeth and surfaces and fewer decayed surfaces and teeth than non-high school graduates ( $p < 0.05$ ).

There was a seasonal variation in the total number of new recruits who arrived at Great Lakes which corresponded to overall Navy recruiting variation and high school graduation in the spring. At Great Lakes there was a wide range in the number of recruits available per week (Figure 2). Although the overall caries experience of naval recruits did not vary significantly over a year (Table III), the Naval Regional Dental Center's workload was immensely increased during the summer months.

The latest data available from surveys of non-military populations, the National Health Survey 1960-1962 (14), indicated that naval recruits (DT = 6.5) arrived at Great Lakes with three times the number of decayed teeth compared with their civilian counterparts (DT = 2.2).

#### Incidence of Dental Caries

Of the subjects selected for service school, 354 of a total of 799 (44.3%) subjects were available for re-examination at the end of six months. The mean interval between the initial and second examination was 188.3 days (S.D. 42.5). Six-month data were used to calculate measures of incidence -- caries attack rates (CAR AND PPCAR). Both the CAR and PPCAR indicated that after six-months in the naval service there was an increase in carious surfaces which could be detected as needing clinical restorative treatment.

Table IV and V illustrate the mean values of personal characteristics at the time of recruitment and dental indices at the initial examination, respectively, for those subjects available for the six-months' examination.



As can be noticed, approximately one man in three entered the Navy with a U or urgent lesion in need of immediate restoration. Table VI indicates the mean number of sound surfaces at the initial examination in need of restoration at the six-month examination. The CAR and PPCAR values have been multiplied by 100 to reflect the rates per 100 surfaces initially at-risk. It can be seen that there was a 2.5 percent and 4.0 percent increase in carious surfaces overall and for the posterior proximal surfaces respectively.

When the sample was stratified by the depth of the subjects' deepest caries into dentin, the CAR and PPCAR values became as shown in Table VII. Those individuals with the deepest lesions (i.e., C or U-lesions) initially had significantly greater CAR and PPCAR values at six months -- more new decayed surfaces. Those individuals with the deepest carious lesions could be considered as being at highest risk for new decayed surfaces after six months in the Navy. The CAR and PPCAR, or the incidence of detectable, new carious lesions at six months, were not evenly distributed among the sample, however, but were more frequently associated with those of the sample who initially were most in need of dental treatment for caries (those with the greatest number and deepest carious lesions). As can be seen from Figures 3 and 4, the contribution to CAR and PPCAR by individuals was not evenly distributed for the sample.

When CAR and PPCAR were stratified by Mental Group Score (the categorization of AFQTS used by Navy recruiters) there was a significant difference in CAR for the lowest mental groups. These men also had a very high PPCAR, although because of high variance the rate was not significantly different, Table VIII. Those in the lowest mental group were also those least likely to complete their recruit training. There were no regional differences found for CAR and PPCAR when stratified by residence of subjects prior to enlistment. Likewise, there were no significant age differences in the sample with respect to CAR and PPCAR.

Screen Score is a measure Navy recruiters use to indicate the percent probability an individual has in completing the first year of enlistment. There were significant differences in CAR for the sample according to Screen Score; those who had a higher probability of success had a significantly lower mean CAR than those with a lower probability of being successful in the Navy, Table IX. Similar trends were observed for PPCAR but the differences were not statistically significant.

Besides providing information on the number of cavities, caries attack rates, and depth of carious lesions, the data were sorted to obtain information on the geographic distribution of dental caries by anatomical site. Six teeth, numbers 3, 9, 12, 19, 25 and 28 (See Figure 1), were observed for caries experience, and the results are presented in Table X. There were statistically significant ( $p = 0.001$ ) positive correlations between the DS, FS, DFS, and SAR counts on these six teeth and the counts for the whole mouth. In the 354 service school subjects who were followed for six months, the DS increment of the six teeth had a positive and significant correlation ( $r = +0.78$ ,  $p = 0.001$ ) to the total recording. These six teeth, therefore, may be useful in screening surveys. The

ranking of the teeth for frequency of positive caries status, from highest to lowest, was: Nos. 19, 3, 12, 9, 28, 25. This agrees with Klein and Palmer (15) whose study indicated that the most caries prone surfaces were the posterior proximal and occlusal surfaces. Even within those groups there were differences. The mesial and occlusal surfaces of tooth 28 did not have the same caries experience as other posterior proximal and occlusal surfaces; they behaved more like anterior surfaces. This confirms an earlier study (2).

#### Treatment Needs

The total dental treatment needs were initially computed for 799 service school-selected naval recruits. Of this number, 354 were available for re-treatment planning at the end of six months. Table XI illustrates the mean number of restorative treatment procedures needed for 799 service school-selected recruits. It can be noted that a small percentage of the sample, on the average, needed no amalgam fillings. To the other extreme, 5 percent of the sample needed treatment due to caries considerably far above the mean values for restorations.

Table XII, for the 354 subjects on whom six-month data were available, shows the treatment procedures performed during the first six months of enlistment. Over half of the mean amalgam restorations planned initially were actually accomplished during the first six months, but for only about half of the population needing treatment. A small percentage of subjects received a large number of restorations.

At the six-month examination, treatment plans were formulated for 354 subjects. As Table XIII illustrates, only about 30 percent of the sample needed no further treatment in the form of amalgam restorations; again, a disproportionately small number of subjects required treatment far above the mean for the sample.

The Veterans Administration fee schedule for 1975 was used to compute the value of services required and performed. The resulting value of total services required was calculated to be \$313,414 per 1000 recruits. The individual procedures were weighted according to factors in the Dental Profile System (BUMED Notice dtd 10 November 1976) and it was estimated that 461,480 minutes per 1000 recruits were needed to complete the required treatment for 1000 recruits at entry into the Navy (or 2,644 dental officer and dental technician man-days per 1000 recruits). The value of initial treatment required for restoration of carious teeth was computed to be \$140,360 per 1000 recruits (45 percent of total treatment costs).

#### DISCUSSION

From the data presented, it would appear that naval recruits who received their basic training at Great Lakes had a distinctly higher prevalence of untreated dental caries compared to a similar age group of civilians. The accumulated need for treatment due to caries attack (i.e., operative procedures) at entry into the Navy was far in excess of the fiscal and manpower resources to complete treatment as evidenced by the level of treatment procedures still needed at the six-months examination.

If one compares average treatment procedures needed initially and at six months, it can be seen that naval recruits at six months needed about half as many restorations as they did at entry. But, as has been demonstrated, the need for treatment and the treatment accomplished were not evenly distributed among the sample. A portion of the sample needed a disproportionately greater amount of treatment procedures. One item of information which would have been useful in the analysis was the proportion of recruits who received treatment but for some reason did not complete recruit training or even their first year of enlistment. We do not, unfortunately, have this information as yet. It has been reported that 55% of attrition in boot camp occurs in the first five weeks (16). The dental treatment accomplished for those persons was a loss to the Navy.

The treatment needed at six months did not reflect the need for treatment due to new carious surfaces alone. But when the sample remaining at six months was stratified by  $CAR \leq 0$  and  $CAR > 0$ , and  $PPCAR \leq 0$  and  $PPCAR > 0$ , it can be seen from Table VII that those with the greatest number and deepest carious lesions initially, had significantly inflated caries attack rates during the six-month interval. Thus, those initially with the deepest carious lesions and the greatest number of carious lesions were most at-risk for new decayed tooth surfaces after six months. And, as can be seen from Table XII, five percent of the sample had consumed a disproportionately large number of dental procedures compared to the mean value. They also consumed an inequitable amount of resource dollars.

The importance of these data is in their utilization. In recruit training, are we concentrating our dental resources on a small group of individuals most ravaged by dental caries to the exclusion of a larger group who might be more likely to finish their first year of enlistment? Examination of the Screen Score with respect to caries incidence (i.e., CAR and PPCAR) demonstrates that those most likely to succeed in the Navy have the least restorative treatment needs at enlistment and the lowest caries attack rates (CAR and PPCAR). But, in the prioritization of treatment, with limited manpower resources and constrained time requirements (i.e., recruit training schedule), do we spend a disproportionate share of our resources on a portion of the population who may not be successful in the Navy (i.e., those with low Screen Scores and low Mental Group Scores)? The answers are not currently available, but indeed research efforts should be undertaken to define the effectiveness of treatment provided in terms of the returns to the naval service and individual dental patients.

Six-monthly topical applications of stannous fluoride have been shown to have a positive effect on the caries increment among naval personnel (17). Since different groups of naval recruits have differing caries attack rates, might it not be more cost-effective to fight the infection of dental caries more intensively and earlier for those most at-risk than to treat all incoming naval recruits at the same level of intensity? It has also been found that there are anatomical site differences in caries attack. This fact should be used to direct fluoride treatment where it is needed the most.

If predictors such as initial DMFS scores or its component scores in conjunction with pre-induction scores such as AFQTS, Mental Group Scores, Screen Scores or others were found useful in identifying those most at-risk for new disease, a more intensified preventive program for those most at-risk might prove more beneficial for the naval service and for the individual dental patient. Our data indicate that to some extent at least the initial DMFS scores and components, depth of initial carious lesions, used in combination with AFQTS, Mental Group Scores, and Screen Scores, are useful in identifying those most at-risk for new caries. Admittedly, the CAR and PPCAR could reflect the degree of missed diagnoses due to clinically undetectable incipient carious lesions at the initial examination. But, it is nevertheless true that new carious surfaces do need filling at six months at high estimated costs. Six-month incidence data for dental caries are not without pitfalls. Two or three year data would be ideal, but due to our inability to perform follow-up examinations on individuals once they leave the Great Lakes area, these data are the best we have. Projects are anticipated to monitor the oral health status of naval personnel who are now on the permanent staff of the various commands in the Great Lakes area. The results of these studies should aid in identifying more clearly, with longer term data, those most at-risk for dental caries and other dental diseases. With the new information, preventive programs aimed at the need for treatment of specific groups of naval people could be implemented with an enhanced cost-effectiveness. In addition, the preventive measures could be applied to the specific sites in the mouth where the risk is greater (posterior proximal areas).

#### SUMMARY

The prevalence of dental caries in naval recruits at Great Lakes is 98%. The prevalence is so high that measures of severity are required to sort out the significance on a public health basis. It was found that the most severe carious lesions (U-lesions) were concentrated in about one third of the population. These men also had a higher number of carious lesions, and so they consumed the majority of treatment procedures provided during short periods of availability in recruit training. Yet, they subsequently had the highest caries attack rates. Prediction of those with high caries attack rates can be based upon a high number of carious lesions, presence of U-lesions, low AFQTS and low Screen Scores, in part. It is recommended that these men be singled out for extraordinary measures of preventive dentistry, especially directed to the posterior proximal surfaces where the caries attack rate appear to be the highest.

#### ACKNOWLEDGMENTS

The authors thank Captain Clark and Lieutenant Commander Galich for their help in the examination process. Captains McCleod, McLaughlin, and Lohr of the Naval Regional Dental Center, Great Lakes for their invaluable cooperation; DT2 Hoefs, DT3 Ellingson for their assistance in managing the data; DT1 McCormick, DT2 Bailey, DT3 Pepper, and DN Johnson for chairside assistance; Ms. Rouse, Ms. Grisham, and Ms. Ballantini for their clerical assistance and manuscript preparation; and NDRI consultants, Drs. Abramowitz and Hoerman, for their review and suggestions.

# BIBLIOGRAPHY

1. Schlack, C. A. and Birren, J. E. Time required to treat dental defects in 71,015 naval personnel, with regional and age variation. J. Am. Dent. Assoc. 33:1406-18, Nov. 1946.
2. Massler, M., Ludwick, W. and Schour, I. Dental caries and gingivitis in males 17 to 20 years old (at Great Lakes Naval Training Center). J. Dent. Res. 31:195-199, Apr. 1952.
3. Hollander, F. and Dunning, J. M. Study by age and sex of incidence of dental caries in over 12,000 persons. J. Dent. Res. 18:43-60, Feb. 1939.
4. Cross, J. W. The dental treatment needs of naval personnel as derived from 1570 cases. J. Dent. Res. 31:335-340, June 1952.
5. Hellman, L. P., Ludwick, W. E. and Oesterling, B. W. Naval dental needs and treatment. J. Am. Dent. Assoc. 55:828-833, Dec. 1957.
6. Rovelstad, G. H., et al. Workshop on naval and Marine Corps recruit dental programs. NDRI-PR 69-09, 3 October 1969, 62 pp. (p. 34).
7. Farrell, P. E. Maintenance dental care study of personnel of USS New Jersey, BB-62. NDRI-PR 70-02, 10 June 1970, 11 pp.
8. Keene, H. J. Dental health of naval personnel. Milit. Med. 139:901-906, Nov. 1974.
9. Rovelstad, G. H. The impact of military dental care on dental health. Milit. Med. 131:168-177, Feb. 1966.
10. Gross, H. W. and Guger, M. D. A two-year comparison dental study of 132 naval reserve recruits. Milit. Med. 135:138-142, Feb. 1971.
11. Rovelstad, G. H., et al. Survey of dental health of the naval recruit. I. Status of dental health. J. Am. Dent. Assoc. 58:60-68, May 1959.
12. Klein, H., Palmer, C. E. and Knutson, J. W. Studies on dental caries. I. Dental status and needs of elementary school children. Pub. Hlth. Rep. 53:751-765, 1938.
13. World Health Organization. Oral Health Surveys Basic Methods. W.H.O., Geneva, 1971.
14. U.S. Public Health Service, National Center for Health Statistics. Decayed, missing, and filled teeth in adults: United States -- 1960-62. Washington, D. C., Government Printing Office, 1967. Publ. No. 1000--Series 11--No. 23., 47 p. (p. 17).

15. Klein, H. and Palmer, C. E. The disparity between dental need and dental care in school children of Hagerstown, MD., and environs. J. Am. Dent. Assoc. 28:1489, Sept. 1941.
16. Gelli, T. J. Anatomy of recruit-training attrition. Defense Manag. J. 15:34-35, July-Aug., 1979.
17. Scola, F. P. Clinical evaluation of stannous fluoride when used as a constituent of a compatible prophylactic paste, as a topical solution, and in a dentifrice in naval personnel. II. Report of findings after two years. J. Am. Dent. Assoc. 77:594-597, Sept. 1968.

TABLE I

NUMBER, AGE, RESIDENCE AND EDUCATIONAL BACKGROUND OF  
NAVAL RECRUITS AT GREAT LAKES, 1975-1978

	Random Selected		Service School Selected	
Number	433		753	
Age, last birthday†	18.9		19.1	
High School††	N	%	N	%
Graduate	314	73.5	659	87.7
Non-Graduate	113	26.5	92	12.3
Total	427	100.0	751	100.0
Residence†††	N	%	N	%
City	161	37.5	285	37.9
Town	260	60.6	450	59.9
Farm	8	1.9	16	2.1
Total	429	100.0	751	99.9

†Welch's  $t = 0.70$  (not significant).

††  $\chi^2(1) = 38.26$  (significant at  $P < 0.001$ ).

†††  $\chi^2(4) = 0.13$  (not significant).



TABLE II  
DENTAL CARIES EXPERIENCE OF NAVAL RECRUITS AT  
GREAT LAKES, 1975-1978

	Random Selected (N=429)	Service School Selected (N=751)
Cariou Teeth (DT)*	6.5	5.9
Missing Teeth (MT)	0.6	0.5
Filled Teeth (FT)	5.8	6.3
DMF Teeth	10.9	10.7
DT/DMFT**	0.6	0.5
Cariou Surfaces (DS)	9.7	8.7
Missing Surfaces (MS)	2.9	2.4
Filled Surfaces (FS)	10.3	11.2
DMFS Surfaces	21.9	21.3
DS/DMFS**	0.5	0.4
DT = 0	23 (5.4%)	74 (9.9%)
DMFT = 0	8 (1.9%)	14 (1.9%)
Surfaces at Risk:		
Overall (SAR)	115.2	116.2
Posterior Proximal (PPSAR)	20.9	21.2

\*Significant (P < 0.025).

\*\*Significant (P = 0.001).

TABLE III  
SEASONAL VARIATION IN THE STATUS OF NAVAL RECRUITS AT  
GREAT LAKES, 1975-1978

VARIABLE	JAN-MAR	APR-JUN	JUL-SEP	OCT-DEC
High School* Graduates (+GED)	79%	80%	89%	83%
DMFT	10.9	10.1	10.8	11.2
DMFS	22.8	19.8	21.1	22.5
NPDI*	17.9	19.6	19.1	19.1
CSI*	8.1	8.2	7.3	9.0

\*Significant ( $p < 0.05$ ).

TABLE IV  
MEAN VALUES OF AFQT SCORE, SCREEN SCORE, AGE AND EDUCATION  
ATTAINED FOR SERVICE SCHOOL GRADUATES, GREAT LAKES,  
ILLINOIS, 1975-1978

	X	S.D.	N*
Age	20.80	2.131	341
AFQTS	74.50	14.697	337
Screen Score	87.08	4.547	238
Education (years)	12.03	0.925	341

\*Includes only those subjects with complete data for each variable.

TABLE V

MEAN VALUES FOR CARIES INDICES FOR 354 SERVICE SCHOOL  
GRADUATES, GREAT LAKES, ILLINOIS, 1975-1978  
INITIAL EXAMINATION

Caries Indices	X	S.D.	% of Sample with Index Score of Zero
DS	7.9	8.06	11.0
MS	2.2	5.53	79.1
FS	11.9	11.15	12.7
DMFS	21.2	14.43	1.4
BLES	5.0	3.93	12.2
CLES	0.3	0.79	84.5
ULES	0.5	1.21	68.0

Includes only those subjects with complete data for each variable.

TABLE VI

MEAN CAR AND PPCDR VALUES FOR 354 NAVAL RECRUITS, GREAT LAKES,  
ILLINOIS, 1975-1978. DERIVED FROM INITIAL  
AND SIX-MONTHLY EXAMINATIONS

Rate	X	S.D.	Rate for 100 Surfaces
CAR	0.025	0.0812	2.5
PPCAR	0.040	0.1811	4.0

TABLE VII

RELATIONSHIP OF CARIES ATTACK RATES TO DEPTH OF DEEPEST  
CARIOUS LESIONS AT INITIAL EXAMINATION

Carious Lesion Type at Initial Examination	No. Subjects	Mean No. of Lesions	*CAR x 100	*PPCAR x 100
No lesions	38	0.00	0.90	2.40
B only	201	4.72	1.60	1.80
B, C, U	115	B = 7.09 C = 0.77 U = 1.51	3.60	8.10

\*Significant ( $p < .05$ ), ANOVA.

TABLE VIII

RELATIONSHIP OF MENTAL GROUP SCORE AND CAR AND PPCAR, FOR  
NAVAL RECRUITS. GREAT LAKES, ILLINOIS, 1975-1978

Incidence Rate	Mental Group Score*				p
	I	II	IIIU	IIIL	
CAR	2.3	1.8	1.7	7.5	<0.005
PPCAR	3.8	3.7	3.4	9.9	>0.05

*Mental Group Score	AFQTS Range	N
I	95-99	33
II	67-94	183
IIIU	50-66	88
IIIL	35-49	18
IV	01-34	0
		322**

\*\*31 subjects no Mental Group Score available.

TABLE IX

RELATIONSHIP OF CAR, PPCAR AND SCREEN SCORE FOR NAVAL  
RECRUITS AT GREAT LAKES, ILLINOIS,  
1975-1978, SIX-MONTH DATA

Incidence Rate	Grouped Screen Score			p-value
	71-83 (N=52)	84-89 (N=90)	90-96 (N=96)	
CAR	3.9	1.8	1.7	<0.05
PPCAR	4.9	4.6	-0.9	>0.05

TABLE X

FREQUENCY OF CARIES STATUS FINDINGS IN A PARTIAL RECORDING  
OF NAVAL RECRUITS AT GREAT LAKES, 1975-1978 (PERCENTAGE)  
FIRST EXAMINATION

Tooth Number	Caries Status*	Facial		Lingual		Proximal		Occlusal 0
		G	R	G	R	Mes	Dis	
3	0	96	90	97	57	61	78	13
	F	3	6	2	30	25	9	62
	D	1	3	1	12	12	13	17
	DF	0	1	0	1	1	1	8
9	0	98	97	99	94	95	91	98
	F	1	3	1	4	3	5	2
	D	1	1	0	1	2	3	0
	DF	0	0	0	0	0	1	0
12	0	99	99	99	98	92	78	75
	F	0	0	0	1	3	8	17
	D	1	1	1	1	5	13	7
	DF	0	0	0	0	0	1	1
19	0	91	58	93	92	69	69	15
	F	5	30	4	6	17	13	64
	D	4	11	3	3	13	18	16
	DF	1	1	0	0	1	1	6
25	0	100	99	100	100	98	98	99
	F	0	1	0	0	1	1	1
	D	0	0	0	0	1	1	0
	DF	0	0	0	0	0	0	0
28	0	98	100	100	100	98	88	86
	F	2	0	0	0	2	5	9
	D	0	0	0	0	1	8	4
	DF	0	0	0	0	0	0	1

\*0 = Sound, F = Restored, D = Carious, DF = Restored and Carious, G = Gingival third, R = Remainder, Mes = Mesial; Dis = Distal, 0 = Occlusal.

TABLE XI

NAVAL RECRUIT AND SERVICE SCHOOL STUDENT INDIVIDUAL DENTAL SERVICE  
PROCEDURES, NEEDS AND ACCOMPLISHMENTS, SIX MONTHS  
EXAMINATION 1 TO EXAMINATION 5,  
(INITIAL PROJECTED TREATMENT)

(N = 799)	INITIAL PROJECTED TREATMENT (IPT)			
	Mean $\pm$ SD	None Required N	%	5% of the Recruits Require
Operative and Crown and Bridge				
Amalgam (One surface)	3.286 $\pm$ 2.946	139	17.4	9 or more
Amalgam (Two or more surfaces)	3.263 $\pm$ 3.597	211	26.4	10 or more
Base intermediate	7.253 $\pm$ 5.847	65	8.1	18 or more
Resin	0.760 $\pm$ 1.922	592	74.1	4 or more
Root canal filling (teeth)	0.099 $\pm$ 0.399	740	92.6	1 or more
Temporary	0.209 $\pm$ 0.815	735	92.0	2 or more
Bridge	0.003 $\pm$ 0.050	797	99.7	1
Crown	0.036 $\pm$ 0.269	780	97.6	1 or more
IPT Oper Subtotal*	7.262 $\pm$ 5.849	64	8.0	18 or more
Prosthodontics				
Full denture	-----	799	100.0	-----
Partial denture	0.029 $\pm$ 0.201	781	97.7	1 or more
Other maxillofacial appliances	-----	799	100.0	-----
Oral Surgery				
Abscess, incision and drainage	-----	799	100.0	-----
Alveolectomy	-----	799	100.0	-----
Apicoectomy	-----	799	100.0	-----
Biopsy	-----	799	100.0	-----
Cystectomy	-----	799	100.0	-----
Fracture reduction	-----	799	100.0	-----
Root residual - removal	0.089 $\pm$ 0.740	782	97.9	1 or more
Tooth removal	0.602 $\pm$ 1.078	555	69.5	1 or more
Tumors (all types) excision	0.003 $\pm$ 0.050	797	99.7	1
Periodontics and oral hygiene				
Equilibration	-----	799	100.0	-----
Gingivectomy	0.031 $\pm$ 0.174	774	96.9	1
Gingivitis or stomatitis treatment	0.010 $\pm$ 0.122	793	99.2	1 or more
Prophylaxis	0.995 $\pm$ 0.071	4	0.5	1
Scaling (periodontal)	0.811 $\pm$ 0.468	177	22.2	1 or more
Caries prevention treatment	-----	All recruits require 2 treatments		
Plaque control instruction	4.836 $\pm$ 0.573	0	0.0	5 or more
IPT Perio Subtotal**	1.816 $\pm$ 0.498	4	0.5	2 or more
X-ray				
Intra-oral roentgenogram	3.254 $\pm$ 2.440	0	0.0	7 or more
Extra-oral roentgenogram	1.001 $\pm$ 0.061	1	0.1	1 or more
Other				
Examinations (Types 1, 2 and 3)	1.891 $\pm$ 0.527	1	0.1	2 or more
Post Operative Treatment	0.035 $\pm$ 0.204	772	96.7	1 or more
TOTAL PROCEDURES	30.437 $\pm$ 14.038	0	0.0	56 or more

\*Amalgams and resins.

\*\*Ging Tx, PRO and Pdt Sc.

TABLE XII

NAVAL RECRUIT AND SERVICE SCHOOL STUDENT INDIVIDUAL DENTAL SERVICE  
PROCEDURES, NEEDS AND ACCOMPLISHMENTS, SIX MONTHS  
EXAMINATION 1 TO EXAMINATION 5,  
(PROCEDURES PERFORMED)

(N = 355)	Mean $\pm$ SD	PROCEDURES PERFORMED (DPSA)		
		None Performed N	%	5% of students underwent
Operative and Crown and Bridge				
Amalgam (One surface)	1.741 $\pm$ 2.758	186	52.4	7 or more
Amalgam (Two or more surfaces)	1.623 $\pm$ 2.310	173	48.7	6 or more
Base intermediate	3.282 $\pm$ 4.414	138	38.9	12 or more
Resin	0.439 $\pm$ 1.478	302	85.1	3 or more
Root canal filling (teeth)	0.099 $\pm$ 0.326	323	91.0	1 or more
Temporary	0.315 $\pm$ 0.964	304	85.6	2 or more
Bridge	-----	355	100.0	-----
Crown	0.014 $\pm$ 0.118	350	98.6	1
DPSA Oper Subtotal	3.803 $\pm$ 4.779	123	34.6	13 or more
Prosthodontics				
Full denture	-----	355	100.0	-----
Partial denture	0.014 $\pm$ 0.118	350	98.6	1
Other maxillofacial appliances	0.008 $\pm$ 0.092	352	99.2	1
Oral Surgery				
Abscess, incision and drainage	-----	355	100.0	-----
Alveolectomy	0.034 $\pm$ 0.196	344	96.9	1 or more
Apicoectomy	0.003 $\pm$ 0.053	354	99.7	1
Biopsy	-----	355	100.0	-----
Cystectomy	0.023 $\pm$ 0.149	347	97.7	1
Fracture reduction	-----	355	100.0	-----
Root residual - removal	0.065 $\pm$ 0.541	349	98.3	2 or more
Tooth removal	0.521 $\pm$ 1.012	264	74.4	2 or more
Tumors (all types) excision	-----	355	100.0	-----
Periodontics and oral hygiene				
Equilibration	0.014 $\pm$ 0.176	352	99.2	1 or more
Gingivectomy	0.014 $\pm$ 0.140	351	98.9	1 or more
Gingivitis or stomatitis treatment	0.031 $\pm$ 0.174	344	96.9	1
Prophylaxis	0.163 $\pm$ 0.453	305	85.9	1 or more
Scaling (periodontal)	0.070 $\pm$ 0.287	332	93.5	1 or more
Caries prevention treatment	1.558 $\pm$ 0.591	10	2.8	2 or more
Plaque control instruction	2.439 $\pm$ 1.327	5	1.4	4 or more
DPSA Perio Subtotal	0.265 $\pm$ 0.675	290	81.7	1 or more
X-ray				
Intra-oral roentgenogram	3.186 $\pm$ 2.204	1	0.3	6 or more
Extra-oral roentgenogram	0.780 $\pm$ 0.428	80	22.5	1 or more
Other				
Examinations (Types 1, 2 and 3)	2.366 $\pm$ 1.334	84	23.7	5 or more
Post Operative Treatment	0.256 $\pm$ 0.728	299	84.2	1 or more
TOTAL PROCEDURES	19.031 $\pm$ 12.520	0	0.0	42 or more



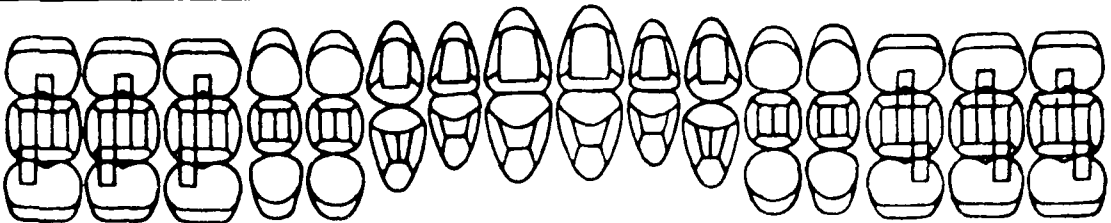
TABLE XIII

NAVAL RECRUIT AND SERVICE SCHOOL STUDENT INDIVIDUAL DENTAL SERVICE  
 PROCEDURES, NEEDS AND ACCOMPLISHMENTS, SIX MONTHS  
 EXAMINATION 1 TO EXAMINATION 5,  
 (PROCEDURES STILL REQUIRED)

(N = 354)	Mean $\pm$ SD	PROCEDURES STILL REQUIRED (PT)		
		None Required N	%	5% of graduates still required
Operative and Crown and Bridge				
Amalgam (One surface)	2.186 $\pm$ 2.185	96	27.1	6 or more
Amalgam (Two or more surfaces)	2.432 $\pm$ 2.670	113	31.9	7 or more
Base intermediate	4.938 $\pm$ 4.079	37	10.5	12 or more
Resin	0.319 $\pm$ 0.908	292	82.5	1 or more
Root canal filling (teeth)	0.003 $\pm$ 0.053	353	99.7	1
Temporary	0.008 $\pm$ 0.119	352	99.4	1 or more
Bridge	-----	354	100.0	-----
Crown	0.014 $\pm$ 0.219	352	99.4	1 or more
PT Oper Subtotal	4.938 $\pm$ 4.079	37	10.5	12 or more
Prostodontics				
Full denture	-----	354	100.0	-----
Partial denture	0.011 $\pm$ 0.130	351	99.2	1 or more
Other maxillofacial appliances	-----	354	100.0	-----
Oral Surgery				
Abscess, incision and drainage	-----	354	100.0	-----
Alveolectomy	-----	354	100.0	-----
Apicoectomy	-----	354	100.0	-----
Biopsy	-----	354	100.0	-----
Cystectomy	-----	354	100.0	-----
Fracture reduction	-----	354	100.0	-----
Root residual - removal	-----	354	100.0	-----
Tooth removal	0.331 $\pm$ 0.897	291	82.2	2 or more
Tumors (all types) excision	-----	354	100.0	-----
Periodontics and oral hygiene				
Equilibration	-----	354	100.0	-----
Gingivectomy	0.017 $\pm$ 0.129	348	98.3	1
Gingivitis or stomatitis treatment	0.003 $\pm$ 0.053	353	99.7	1
Prophylaxis	0.980 $\pm$ 0.140	1	2.0	1
Scaling (periodontal)	0.700 $\pm$ 0.495	112	31.7	1 or more
Caries prevention treatment	-----	354	100.0	-----
Plaque control instruction	1.717 $\pm$ 0.553	0	0.0	2 or more
PT Perio Subtotal	1.683 $\pm$ 0.540	1	2.0	2 or more
X-ray				
Intra-oral roentgenogram	0.020 $\pm$ 0.265	352	99.4	3 or more
Extra-oral roentgenogram	0.218 $\pm$ 0.413	277	78.2	1
Other				
Examinations (Types 1, 2 and 3)	0.686 $\pm$ 0.477	113	32.0	1 or more
Post Operative Treatment	0.017 $\pm$ 0.129	348	98.3	1
TOTAL PROCEDURES	14.720 $\pm$ 9.137	0	0.0	31 or more

HEALTH RECORD	DENTAL
SECTION 1 DENTAL EXAMINATION	
MISSING TEETH AND EXISTING RESTORATIONS	

F
F

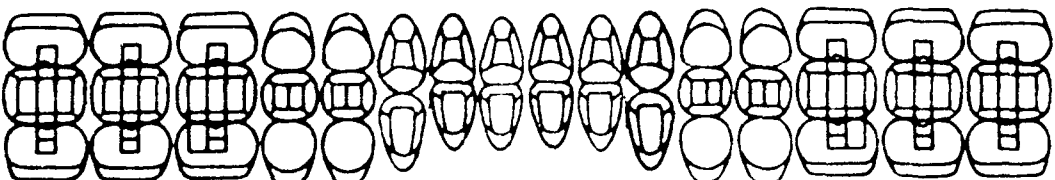


L
L

RIGHT
LEFT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

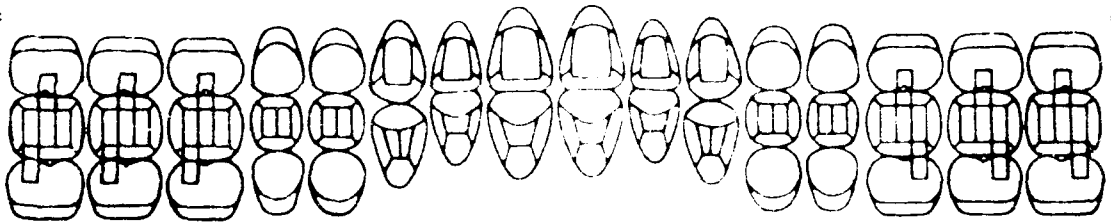
F
F



F
F

DISEASES, ABNORMALITIES, AND X-RAYS															
-------------------------------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

F
F

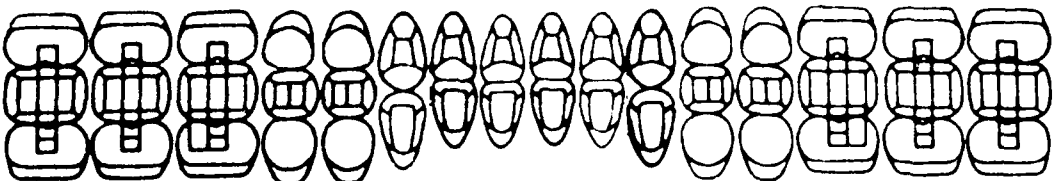


L
L

RIGHT
LEFT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

F
F



F
F

REMARKS

NAME	DATE	DR CODE	EXAM CODE	
------	------	---------	-----------	--

Figure 1: Dental Caries Examination Form.

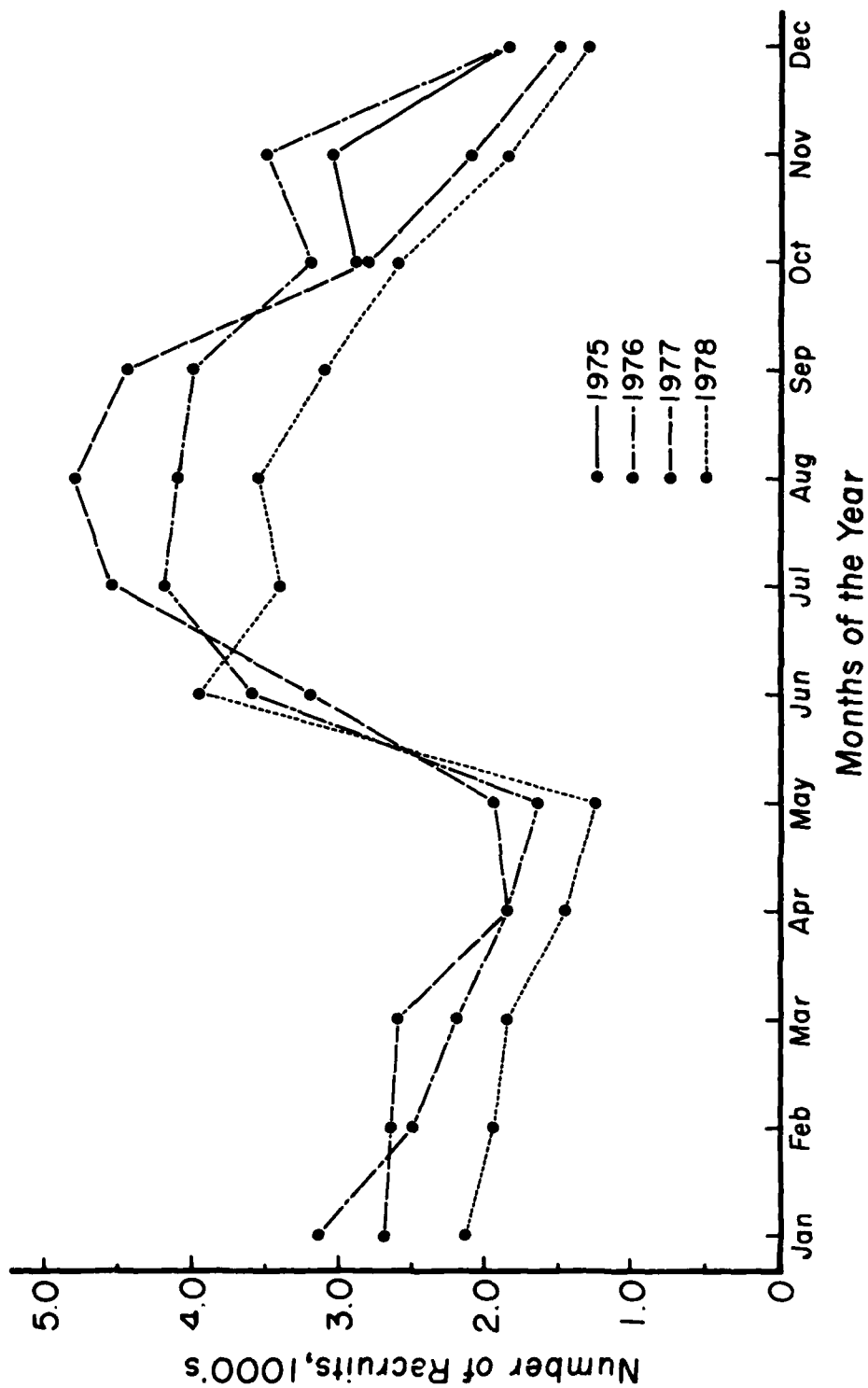


Figure 2: Variation in Recruit Arrivals at RTC, Great Lakes by Month and Year.

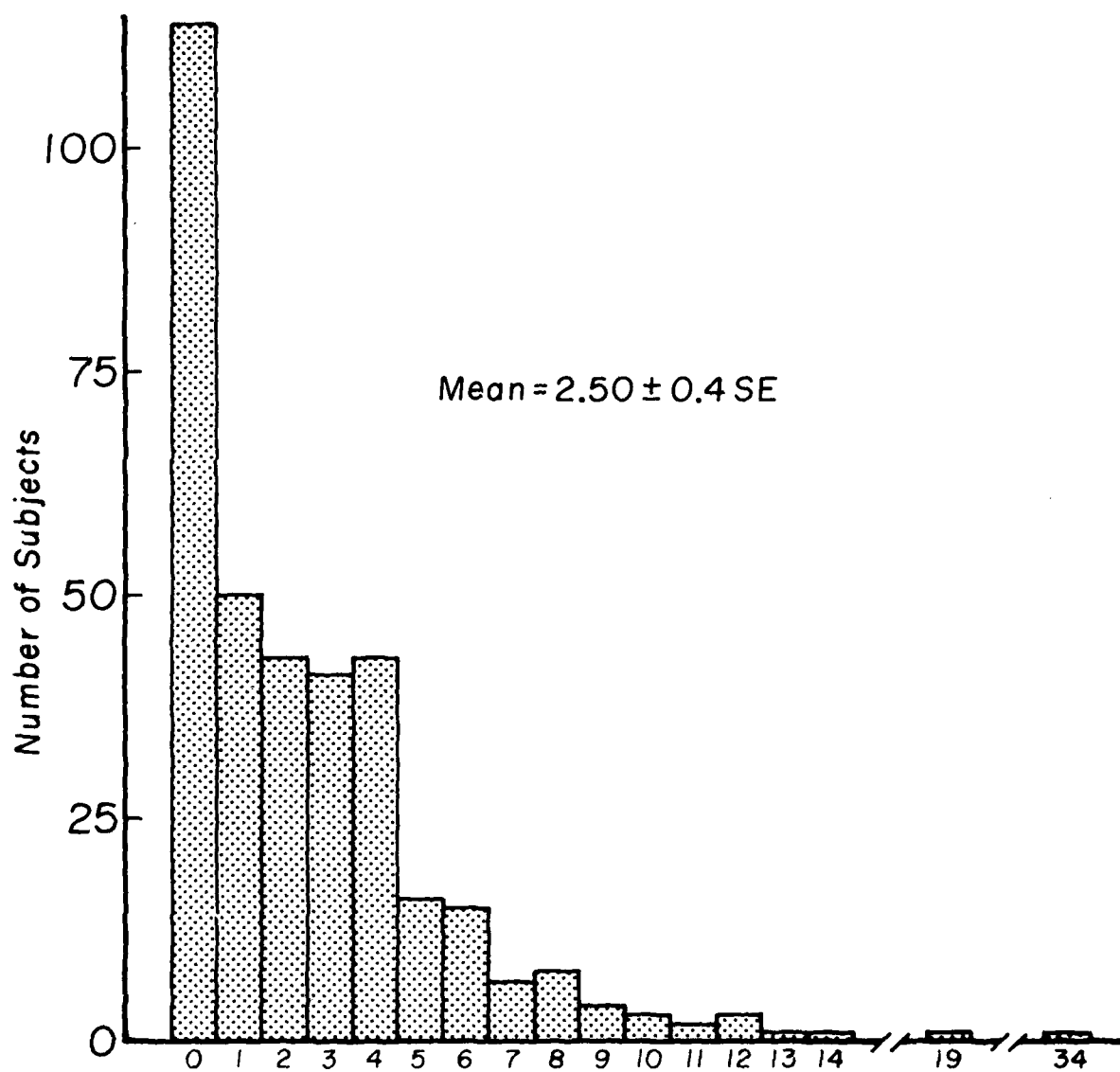


Figure 3: Distribution of 354 Naval Recruit and Service School Graduates at Great Lakes, 1976-78, by Overall Caries Attack Rate (%).

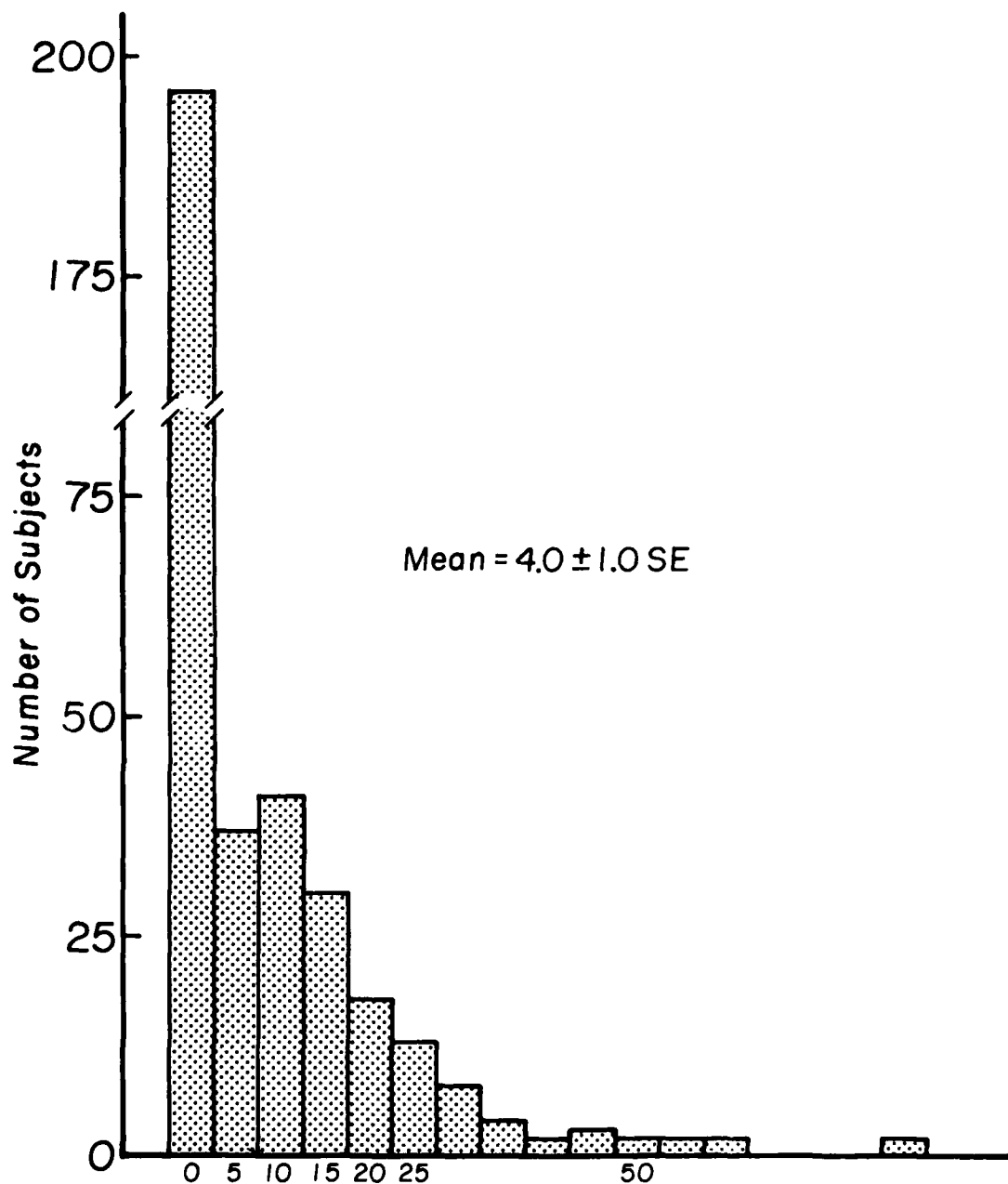


Figure 4: Distribution of 354 Naval Recruits and Service School Graduates at Great Lakes, 1976-78, by Posterior Proximal Caries Attack Rate (%).

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD-A086285	
4. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED
THE HEALTH OF NAVAL RECRUITS: DENTAL CARIES,		
6. AUTHOR(s)		7. PERFORMING ORG. REPORT NUMBER
J. C./CECIL, M. R./WIRTHLIN, R. G./WALTER E. J./MANDEL		NDRI-PR-80-05
8. PERFORMING ORGANIZATION NAME AND ADDRESS		9. CONTRACT OR GRANT NUMBER(s)
Naval Dental Research Institute Naval Base, Bldg. 1-H Great Lakes, IL 60088		(11) May 1980
10. CONTROLLING OFFICE NAME AND ADDRESS		11. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
Naval Medical Research and Development Command National Naval Medical Center Bethesda, MD 20014		ZF58524012-0006
12. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. REPORT DATE
Bureau of Medicine and Surgery Department of the Navy Washington, D. C. 20372		MAY 1980
14. DISTRIBUTION STATEMENT (of this Report)		15. NUMBER OF PAGES
This document has been approved for public release; distribution unlimited.		26
16. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		17. SECURITY CLASS. (of this report)
This document has been approved for public release; distribution unlimited.		UNCLASSIFIED
18. SUPPLEMENTARY NOTES		18a. DECLASSIFICATION/DOWNGRADING SCHEDULE
(17) ZF58524012		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Naval recruits Dental caries Prevalence Incidence Treatment needs (9) Research program reports		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
An epidemiological survey of naval recruits disclosed a high prevalence of unfilled decayed teeth. Those men with the most decayed teeth and the deepest decayed teeth had the highest incidence of new cavities in their first six months of service. There was a positive relationship of these indices of poor dental health with naval recruiters' indicators of low performance potential. This report confirms past surveys that a small portion of naval recruits consume a large proportion of dental care resources. It is recommended that		


DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE  
S/N 0102-LF-014-6601UNCLASSIFIED 102430 226  
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

✓  
the caries-prone men be given extra caries-preventive treatments at their  
most caries-prone anatomical sites,



S/N 0102- LF- 014- 6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)